DOCUMENT RESUME

ED 446 280 CE 080 898

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TITLE	Four Models of On-Line Teaching.
PUB DATE	2000-04-08
NOTE	13p.; In: TEND 2000: Proceedings of the Technological Education and National Development Conference, "Crossroads of the New Millennium" (2nd, April 8-10, 2000, Abu Dhabi, United Arab Emirates); see CE 080 883.
PUB TYPE	Reports - Descriptive (141) -- Speeches/Meeting Papers (150)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	Adult Education; *Adult Learning; Comparative Analysis; Computer Uses in Education; Delivery Systems; *Distance Education; Educational Technology; Foreign Countries; Instructional Effectiveness; Internet; *Models; Online Systems; Postsecondary Education; *Teacher Student Relationship; Teaching Methods; *World Wide Web
IDENTIFIERS	Australia (Queensland); *Central Queensland University (Australia); *Online Courses

ABSTRACT

Four models of online teaching are currently being used within the Faculty of Informatics and Communications at Central Queensland University in Australia. The naive model, which is the most widely used, may be characterized as "putting lecture notes on the World Wide Web" with no opportunities for interaction or feedback. The standard model attempts to make active use of the Web's technology by allowing a significant degree of communication and interaction between students and staff, including through a subject home page, electronic copies of the printed materials dispatched to students before the semester, lecture slides in Powerpoint format, additional notes arising from on-campus lectures and tutorials, copies of past examinations, and links to the electronic mailing list for the subject. The evolutionary model attempts to address several key issues not addressed in the standard model by allowing the exact method of a course's delivery to evolve from semester to semester, based on identified strengths and weaknesses and weekly anonymous feedback from students. The radical model dispenses with lectures entirely. Instead, students are assigned to groups and learn by interacting among themselves and using existing Web-based resources, with academic staff members providing guidance as and when required. (Contains 14 references.) (MN)

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ED 446 280

TEND 2000

Crossroads of the New Millennium

Four Models Of On-Line Teaching

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Abstract

Central Queensland University (CQU) has been at the forefront of institutions seeking to make "flexible delivery" – that is, the delivery of quality education by means other than simply face-to-face lectures and tutorials – a reality. Rather than by some concerted "grand plan", this effort has been led by various individuals often operating according to ad hoc rules developed as reactions to varying circumstances surrounding the nature of both the particular subject material and the student audience.

Presented here are four models to illustrate the diversity of approaches. All four models are currently in use. No claim is made here to present a "best" model; rather the purpose is to illustrate four different approaches which may be equally valid in different contexts.

The models here described are (1) the naïve model, (2) the standard model, (3) the evolutionary model, and (4) the radical model. Each model is described in terms of its aims and rationale, and the context in which it was developed. The paper also describes for each model the provision of resources, the opportunities for interactivity both between staff and students and amongst groups of students, the capabilities for updating materials and correcting errors, and the methods for accepting and processing items of assessment.

It is to be hoped that practitioners at other institutions seeking to improve their online teaching techniques can adapt various aspects of the models described here so as to provide the best possible learning environments for their students.

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Four Models Of On-Line Teaching

Much has been written in the literature about the forces driving the development of online education (see, for example, Daniel, 1997, Farrell, 1998), about how institutions adapt (see, for example, Ehrmann, 1995, Taylor, 1998), and about the advantages and disadvantages of online over face-to-face teaching (see, for example, Wetzel, Radke, and Stern 1994). It is not the aim of this paper to replicate such arguments here, but rather to present four models of online teaching currently in use within the Faculty of Informatics and Communication at Central Queensland University (CQU), a multi-campus, regional university, with seven campuses in Australia and a further three overseas.

The four models of on-line teaching presented here may be described as the naïve model, the standard model, the evolutionary model and the radical model. All four models rely, to differing degrees, on printed material despatched to the students prior to the commencement of semester, in addition to the online features described here.

No attempt is made in this paper to formally evaluate the different models, nor to judge which model is "best". It is the opinion of all of the current authors that such an evaluation is an extremely complex matter unworthy of simplistic quantitative measures. Whether or not a particular model is appropriate depends upon a variety of factors, of which the following must be included:

i. the type of subject matter: for example, theoretical vs practical, technical vs non-technical, etc.
ii. the competencies and personal preferences of the teacher(s);
iii. the prior experiences of the students;
iv. the expectations of the students with regard to the pedagogical methods to
v. be employed;
vi. the maturity and self-study skills of the students.

Further, whether a subject is deemed to have been taught successfully or not, and to what extent, is extremely difficult to measure. A subject offering which garners a 50% pass rate in one semester using one model, and then a 100% pass rate in the following semester using a different model, may or may not be an indication that the second model is preferable; rather, any number of other factors may have influenced the final results, such as the make-up of the student cohort or the marking guidelines employed.

The next four sections describe the four models, together with some comments on their strengths and weaknesses. The final section summarises the whole, and lists some issues which are still to be addressed.

THE NAÏVE MODEL

Of the four models described here, the naïve model is probably the most widely-used, particularly for non-computing subjects, but has been widely disparaged throughout the literature. It may be characterised as "putting the lecture notes on the Web". As such, there are no opportunities for interaction or feedback. Often, the notes are such that they are ill-suited for display on the Web, having been originally designed primarily to assist the lecturer(s) provide face-to-face lectures to on-campus students[1].

Jefferies and Hussain (1998) and many others have made the point that using the internet to support learning and teaching requires a culture change for both the teaching staff and the students. It is not surprising, therefore, that this minimalist model is widely-used by those wary of embarking on such a change.

However, despite its minimalism, the model has some advantages which are worthy of note. Firstly, the model is relatively cheap to implement, in terms of both hardware and software resources and staff time. The material can add significantly to printed and other material sent out to students prior to the commencement of the subject. And the material can be altered relatively simply to correct errors and/or add extra information.

Also, this model is the least threatening to students, since communication in strictly one-way, lecturer to student. No skills are expected of the student beyond the ability to browse Web pages using a standard browser. If notes are put on the Web in some other format, such as pdf, then students may need to know how to access the appropriate reader, such as Adobe Acrobat. However, once mastered by the students in one subject, there is relatively little difficulty in using the same products and skills for subsequent subjects.

[1] In fact the minimalist naïve model as described here is not widely used at CQU; almost all subjects also at least make use of an e-mail list to facilitate communication between students and staff.

The students' time is therefore minimally consumed on mastering the technology, hence leaving maximum time for mastering the subject content, surely a good thing. From the lecturer's point of view, the majority of time and effort can be put into preparing the original material and the lecture notes, also surely a good thing.

Nevertheless, the perceived weaknesses of the naive model, described in much of the literature (eg Taylor, 1998), are such that other more sophisticated models are often to be preferred.

THE STANDARD MODEL

In contrast to the naïve model, the standard model attempts to actively utilise the advantages provided by the technology to allow a significant degree of communication and interaction between students and staff[2].

Features of the standard model include the following: -

- a subject home page from which links to all of the other resources can be found, updated on a regular basis throughout the semester;
- electronic copies in both html and pdf formats of the printed materials despatched to students prior to the start of semester, including copies of all assignment items;
- lecture slides in Powerpoint format, as used for on-campus classes, made available for browsing or downloading;
- additional notes arising from on-campus lectures and tutorials;
- workshop tasks, with additional notes as appropriate, and solutions;
- assignment marking guidelines and sample solutions;
- links to full contact details, including e-mail addresses and 'phone numbers, of the subject co-ordinators;
- copies of past examinations for the subject and hints and tips for the forthcoming examination;
- links to the electronic mailing list for the subject;
- a list of recent updates and additions, in date order.

[2] The standard model has been used for a variety subjects, including the Winter, 1999, offering of 85102 Programming B, a subject requiring mastery of both theoretical and practical components (http://www.infocom.cqu.edu.au/Units/win99/85102/). In this offering the feedback barometer (described under the evolutionary model) was also included.

Web pages, and the various links, without knowledge of either HTML or JavaScript. A number of other commercially available tools could also be used to serve a similar purpose.

Students are required to have good access to the 'net, using a browser such as Netscape or Internet Explorer and be able to use e-mail, but otherwise need have no specialised knowledge.

Lecture slides are made available prior to the lectures wherever possible to enable on-campus students to read them prior to the lectures. Any corrections are notified and a new set of slides, if necessary, uploaded.

Perhaps the most significant difference between the naïve model and the standard model is the provision of an electronic mailing list and/or newsgroup, wherein students can communicate easily and effectively both with each other and with the subject co-ordinators. This provides a much-needed source of direct assistance for problems and other queries.

While the standard model may be seen to offer significant advantages over the naïve model, these come at a cost. In particular may be noted the following:

- the increased amount of time necessary to upload various items of information throughout the semester and to ensure currency;
- the increased expectations on the part of many students for online information to be up-to-date at all times (for example, the provision of lecture slides prior to each lecture);
- the increased expectations on the part of many students for online information to be guaranteed error-free (for example, the solutions to workshop tasks and assignment items);
- the significant additional workload imposed by the need to respond to newsgroup postings on a prompt and regular basis.

THE EVOLUTIONARY MODEL

Although the standard model uses the online technology to some advantage, other problems, such as how to identify and remedy any shortcomings in the content and/or delivery of previous offerings of the subject, remain. Another important issue is that of equity between different student groups; off-campus students often believe they are at a significant disadvantage for many reasons, which include:

- the lack of access to the on-campus lectures and tutorial sessions;
- the difficulty of access to other resources, such as staff members' time, library stocks, etc.;
- the delays caused by the physical transmission of assignments and other subject resources;
- the expense of connecting to the Web for long periods.
- A discussion of these and other problems can be found in (Jones, 1996b).

The evolutionary attempts to address these issues[3]. While the exact method of delivery "evolves" from semester to semester based upon identified strengths and weaknesses, amongst the aspects which normally distinguish the evolutionary model from the standard model are:

- a mirror of the Web site, as it pertains at the beginning of semester, is placed on CD-ROM and delivered to the students alongside the printed material;
- lectures are audio pre-recorded and available both on the CD and from the Web;
- animations are used to explain many of the concepts;
- "live" lectures are given only in response to student requests for further explanation of particular topics. If no requests are forthcoming in a particular week, no lecture is provided;
- web-based archives of mailing list discussions from previous semesters are made available;
- assignments are submitted, recorded, marked, and returned electronically;
- a large number of small assignments are set; however, only a subset of the assignment tasks are actually marked and used for grading purposes
- a feedback barometer is provided, through which students are enabled to provide anonymous feedback as to how the subject is progressing on a weekly basis (Svensson et al, 1999).

Some points arising from the above are worthy of note. Although the printed materials may seem redundant (since the same material appears on the CD), students generally prefer the

[3] The approach described here has been used in many subjects including 85349 Operating Systems in Winter, 1999, (http://www.infocom.cqu.edu.au/Units/win99/85349/). Details of the evolutionary model can be found in (Jones, 1996a) and (Jones, 1999a).

hard-copy, and quality control is ensured. The provision of a CD does, however, enable students to dramatically reduce the time spent online.

Presenting the lectures on the CD means that the lectures must be prepared in advance of the start of semester. They can be recorded either from lectures given as part of a "normal" offering, for use in subsequent semesters, or specially recorded for the purpose.

The provision of supplementary live lectures only "on demand" is an attempt to both reduce the costs associated with the delivery and provide equity to all students, while, at the same time, not denying on-campus students the opportunity for face-to-face lectures as and when the need arises. Issues arising out from such lectures are added to the Web for the benefit of other students.

The setting of a large number of small assessment items ensures that students cover the material in a reasonable fashion, rather than attempting to cram just prior to the examination; the use of only a subset for grading purposes reduces the workload on academic staff.

The online submission system (Jones and Jamieson, 1997) not only treats both on-campus and off-campus students in an equitable fashion but greatly reduces problems caused by late or non-delivery via conventional mail systems. The marking and recording of assignments is also greatly simplified and the process made less prone to human error. Also, electronic submission enables a range of checks to be made to identify plagiarism or unreferenced sources. However, the greatest advantage is the possibility of a much faster turnaround time; typically, reduced from an average of two weeks for paper-based submissions to three working days for online submissions.

The feedback barometer is an interesting mechanism enabling students to provide anonymous feedback on a weekly basis. While it may be natural for some staff to feel concerned that this may encourage unduly negative comments, our experience has been the reverse, in that the comments have, if anything, been rather more positive than might have been expected. Nevertheless, it provides a good mechanism whereby any problems with the subject may be identified in a non-threatening fashion and hence corrected in future offerings.

THE RADICAL MODEL

Whereas all three previous models have attempted, to differing extents, to adapt the traditional face-to-face lecture delivery method to a more suitable online format, the radical model dispenses with lectures entirely. Instead, students are formed into groups and learn by interacting amongst themselves and using the vast amount of existing Web-based resources, with the academic staff member(s) providing guidance as and when required[4].

Distinguishing features of the radical model include:

- a video sent out to all students prior to the commencement of semester explaining the "way the subject works";
- minimal traditional instruction from the academic staff; instead, students are expected to use the set text and make extensive use of search engines and other facilities to seek out resources available on the Web;
- compulsory use of the subject mailing list for communication;
- lectures are replaced by online electronic presentations prepared by the students themselves, each based on the topic for that week;
- students are allocated into groups, each of which is responsible not only for providing an electronic presentation at some point during the semester, but also for responding critically to all other such presentations.

The online student presentations are expected to highlight the main points of that week's topic, to explain and, where necessary, defend these points and to suggest issues for further thought that will engage the rest of the students in a critical analysis and discussion of the presentation. A one-page summary, which can be in the form of a formal abstract, precedes the presentation, followed by a well-argued analysis/critique extending over two further pages (screens). Students are welcome to use additional sources and links as required.

[4] Such a model has been used successfully in the subjects 21608 Information Systems (http://www.infocom.cqu.edu.au/Units/win99/21608/) and 95367 Electronic Commerce in both 1998 and 1999 (http://www.infocom.cqu.edu.au/Units/win99/95367/), all undergraduate subjects. A detailed description of the radical model can be found in (Romm and Taylor 2000).

Students are assessed not just for their group presentation but also for their comments about other presentations. Each group presentation is also assessed on the quality of the discussion that follows; for this reason, it is important to the students that their electronic presentations are well-crafted, thought provoking, and intriguing. Typically, by the end of semester, students will have received over 100 inputs on their work from other students in the group, other groups and the lecturer.

Different assessment criteria may be used – for example, for the electronic presentation, clarity and structure of presentation, originality of ideas and ability to substantiate arguments by relevant data; for other contributions, understanding the arguments that are made by other presenters, linking them to the relevant literature, and making pertinent critical comments about these arguments.

In the last week of term, students are invited to submit a recommendation in writing on each other's group performance. The lecturer considers the group's recommendations when allocating individual marks for group performance to members of the group. A student that a group decides did not contribute sufficiently may as a result suffer a reduction in mark.

The students' final marks are based on a combination of their group work throughout the semester and their performance in a closed-book end-of-semester examination.

Amongst many real advantages of the radical model may be listed the emphasis on group-work, the need to use real-world skills both for effective communication and research and the significantly lower demands on staff time than with most other models. However, students need to adapt early to the demands of the model (the first presentations are made as early as week three or four of the semester), and the model is perhaps more appropriate for postgraduate and later-year undergraduate students rather than recent school-leavers.

CONCLUSION

Four different models of online teaching have been presented, all in current use. Advantages of the naïve model include its relative simplicity and economy in terms of staff time. Advantages of the standard model include better access to resources for students, and opportunities for greater interaction; disadvantages include the amount of staff time needed to facilitate both on-campus and off-campus delivery effectively. The evolutionary model attempts to provide one delivery mode to all students, with online submission of assignment

items, but marking of only a sample; it therefore attempts to provide a quality education without the associated high costs. The radical model dispenses with traditional teaching almost entirely and places the emphasis on the students themselves to learn within a group setting, using the Web for resource material and newsgroups for communication and presentation of assessment items, with the lecturer providing guidance and feedback as required.

The experiences of the current authors would tend to indicate that each of the approaches described here can be perfectly valid, but that, for best results, it is of vital importance that the students be made fully aware from the commencement of the subject as to the model to be employed and the inherent limitations. Thus, the naïve model might be frowned upon by students expecting a high degree of online interaction, while the radical model might be frowned upon by those expecting a more traditional lecture-style presentation; in such cases it is perhaps the expectations, rather than the model, which might profitably be changed.

As a final point, we note that as universities worldwide face up to increasing competition, the development of models which facilitate quality online education while keeping costs to a minimum is likely to be vital to the very survival of those institutions. It is to be fervently hoped therefore that greater encouragement for such experimentation and development will be forthcoming. In the meantime it is anticipated that all four models described here will continue to be refined, and doubtless others developed, as a result largely of individual efforts.

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